Worksheet 1 Arrays, tuples and records

Task 1

1. Write a program to read 6 numbers into an array **numbers[0]** to **numbers[5**], ouput them in reverse order and then output the total and average.

2. A teacher uses a program that stores pupil names in an array. The array is indexed from 0, so the first element in the array is **name[0]**. Occasionally the teacher needs to search for a name to find the student's record number, which is **index + 1**.

   Write a pseudocode algorithm that will search an array **name** containing **max** elements, to find a name and output record number if it exists. If the name does not exist the user should be told the term was not found. Use appropriate prompts for input and output in your solution.

3. Sales quantities of a certain item, calculated to the nearest thousand, for Jan-March, April-June, July-Sep and Oct-Dec are held in separate arrays for each of 3 outlets. The sales figures for each quarter are to be totalled and output in the format

   Total for quarter 1 xxxx

   Total for quarter 2 xxxx

   Total for quarter 3 xxxx

   Total for quarter 4 xxxx

   Write a pseudocode algorithm for this program. Initialise the array with the following test data:

   Outlet1Sales = [10, 12,15,10]

   Outlet2Sales = [5,8,3,6]

   Outlet3Sales = [10,12,15,10]

Task 2

4. (a) Now suppose, in question 3, there were 50 outlets. Assuming the array outletSales[4,50] holds the sales values for each quarter, complete the following program to print the total sales figures for each quarter

```
Fill array outletSales with sales values
Initialise each element of array total[4] to zero

for quarter = 0 to 3
    Add instruction here


        total[quarter] = total[quarter]  + outletSales[quarter,outlet]
    next (complete statement here)
    Add instruction here


  next quarter
```

5. A grid game draws a 6 by 4 grid with each square denoted by "x". A character "O" can move by entering a row coordinate from 1 to 6 and column co-ordinate from 1 to 4. The character starts at array poistion [0,0] (Figure 1) and will move, for example, to row 0 column 1 (Figure 2) if the user enters 1, 2 for the row and column coordinates. **Remember that the indices of the array both start at 0.**

   Write a pseudocode algorithm that creates a 2-D grid[row, column], drawn as shown in Figure 1.

   Prompt the user to enter a row and column value. Update the character position and draw the new grid.

```
O x x x
x x x x
x x x x
x x x x
x x x x
x x x x
```

Figure 1

```
x O x x
x x x x
x x x x
x x x x
x x x x
x x x x
```

Figure 2

6. A company runs a private car park near an airport. The car park has 10 rows numbered 1-10 and each row has spaces (referred to as columns) numbered 1-6 for 6 cars. Customers leave their cars with keys at the car park office, and a driver parks it in a free space and then records where it is parked.
   The space is referenced by its grid coordinates row and column. E.g. a car parked in the 3rd row, 5th space would have the grid reference [3,5].

   The driver enters the car registration into the computer. A car with registration AVH 61 HU parked at grid reference [3,5] would assign "AVH 61 HU" to **park[3,5]**. Empty spaces are denoted, for example, by **park[3,5] = "empty"**

   Write pseudocode for a program which :

   Initialises the grid, with each element holding "empty".

   "Parks a car". This option asks the user to enter the registration number of a car and the grid reference (row and column number) where it has been parked.

   Validates the user entry row between 1 and 10, column between 1 and 6 and asks user to re-enter until entry is valid.

   Checks that this is an empty space, and if it is, puts the registration number in the appropriate element of the array. If it is not, displays "That space is taken" and asks the user to re-enter the grid reference.

   Displays the grid.

Task 3

7. An application is plotting points in 3D space, using x, y, and z coordinates. Explain how the coordinates could be stored in each of the following and justify if the structure is a good choice for this task.

   (a) 1D array

   (b) 2D array

   (c) 3D array

   (d) tuple

   (e) list of tuples

   (f) 1D array of tuples

   (g) array of records

   (h) file of records